Clinical Guideline for the

Diagnosis, Evaluation and Management of Adults and Children with Asthma

Color Key

- **Four Components of Asthma Care**
- Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing **Asthma in Children Aged 0–4 years**
- Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing **Asthma in Children Aged 5–11 years**
- Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing **Asthma in Children ≥12 Years of Age & Adults**
- Long-Term Control Medications: **Estimated Comparative Daily Dosages**
- Long-Term Control Medications: **Usual Dosages**
- Quick-Relief Medications

Guidelines are intended to be flexible. They serve as recommendations, not rigid criteria. Guidelines should be followed in most cases, but depending on the patient, and the circumstances, guidelines may need to be tailored to fit individual needs.

Contents

Criteria that suggest the diagnosis of asthma:

Consider a diagnosis of asthma and perform spirometry if any of these indicators are present*:

- The symptoms of dyspnea, cough and/or wheezing, especially nocturnal, difficulty breathing or chest tightness;
- With acute episodes: hyperinflation of thorax, decreased breath sounds, high pitched wheezing, and use of accessory muscles;
- Symptoms worsen during exercise or in presence of viral infections, inhaled allergens, irritants, weather changes, strong emotional response, stress, menstrual cycles;
- Reversible airflow obstruction: FEV_1>12% from baseline or increase in FEV_1 >10% of predicted after inhalation of bronchodilator, if able to perform spirometry;
- Alternative diagnoses are excluded; see Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma – Summary Report 2007. NIH Publication No 08-5846, October 2007, page 12 (**www.nhlbi.nih.gov/files/docs/guidelines/asthsumm.pdf**).

**Eczema, hay fever, and/or a family history of asthma or atopic diseases are often associated with asthma, but they are not key indicators.*

Goal of Therapy: Control of Asthma

Reduce Impairment

- Prevent chronic and troublesome symptoms (e.g., coughing or breathlessness in the daytime, in the night, or after exertion).
- Require infrequent use (< 2 days a week) of inhaled short-acting $beta_2$-agonist (SABA) for quick relief of symptoms (not including prevention of exercise-induced bronchospasm [EIB]).
- Maintain (near) normal pulmonary function.
- Maintain normal activity levels (including exercise and other physical activity and attendance at school or work).
- Meet patients' and families' expectations of and satisfaction with asthma care.

Reduce Risk

- Prevent recurrent exacerbations of asthma and minimize the need for emergency department (ED) visits or hospitalizations.
- Prevent loss of lung function; for children, prevent reduced lung growth.
- Provide optimal pharmacotherapy with minimal or no adverse effects of therapy.

Four Components of Asthma Care

1. Assessment and Monitoring of Asthma Severity and Control

Assessment and monitoring of asthma are tied to the concepts of severity, control and responsiveness and the domains of impairment and risk.

For assessing asthma severity and asthma control by impairment and risk, *see age-specific charts*.

Components of Asthma Assessment

Medical history and physical exam:

- Assess and document asthma severity and control, including impairment and risk domains.
- Spirometry recommended for patients ≥5 years: (1) at time of initial assessment; (2) after treatment has begun and symptoms and peak expiratory flow (PEF) have stabilized; (3) during periods of loss of asthma control and (4) at least every 1–2 years.
- Identify or review triggers and **precipitating factors** (e.g. allergens, exercise, upper respiratory infection, tobacco smoke, chemicals, weather, strong emotions).
- Assess family, psychosocial, occupational history including stressors.
- Assess medication use, including CAM*. At every visit, review beta-agonist use.
- Assess for co-morbidities (rhinitis, sinusitis, GERD**, obesity, ABPA***, OSA****, stress or depression).
- Conduct physical exam focusing on upper and lower airways, nose and skin.
- Assess impact of asthma on patient and family, patient and family perception of disease, and knowledge and skills for self-management.

* complementary alternative medication, ** gastroesophageal reflux disease, *** allergic bronchopulmonary aspergillosis, **** obstructive sleep apnea

Recommended Approach to Care Management

Initial asthma visit

- Assess severity using both the impairment and risk domains *(See Classifying Asthma Severity and Initiating Treatment in specific age charts).*
- Perform spirometry measurement (FEV_1, FVC, FEV_1/FVC) in all patients ≥5 years old before and after the patient inhales a SABA.
- Assess skills for self-management, including medication administration technique.
- Prescribe appropriate pharmacological therapy based on severity assessment *(See age-specific stepwise chart).*
- Develop and review Asthma Action Plan and provide education.
- Monitor at least at 2–6 week intervals until control is achieved.

Chronic maintenance asthma visit

- Assess asthma control based on impairment and risk *(See Classifying Asthma Control and Adjusting Therapy in specific age charts).*
- Perform spirometry measurement (FEV_1, FVC, FEV_1/FVC) in all patients ≥5 years old at least every 1–2 years when asthma is stable, more often when asthma is unstable, or when clinically indicated by a change in the patient's condition or medication.
- Consider validated questionnaires to assess impairment such as the Asthma Control Test (ACT) (**www.asthmacontrol.com**) and the Asthma Control Questionnaire (ACQ) (**www.qoltech.co.uk/index.htm**).
- Step up or step down treatment based on assessment of control *(See age-specific stepwise chart).*
- Update and review written Asthma Action Plan.
- Provide inactivated influenza vaccine for all patients over 6 months of age, unless a vaccine contraindication exists.
- Provide 23-Valent Pneumococcal Polysaccharide Vaccine (PPSV23) to adults 19 to 64 years (see: **http://www.cdc.gov/vaccines/schedules/index.html**).
- Provide 1 dose of PPSV23 to children aged ≥ 2 years requiring treatment with high-dose oral corticosteroid therapy. For the appropriate timing see the ACIP schedule at: **http://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html**
- Review methods of reducing exposure to relevant allergens and irritants.
- Provide education, emphasizing medication adherence and medication administration technique.
- Schedule an appointment for asthma at least every 6 months after asthma control is achieved and prior to predicted seasonal exacerbations.

Acute exacerbation asthma visit

- Do not underestimate the severity of an exacerbation. Severe exacerbations can be life threatening and can occur in patients at any level of asthma severity or control.
- Assess severity and control and consider co-morbid conditions. For emergency asthma exacerbations, *see Expert Panel Report 3 (EPR-3):* Guidelines for the Diagnosis and Management of Asthma – Summary Report 2007. NIH Publication No 08-5846, October 2007, page 53 (**www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf**).
- Perform spirometry for patients ≥5 years during periods of loss of asthma control.
- Prescribe appropriate pharmacological therapy based on assessment of severity and control *(See age specific stepwise chart).*
- Provide a rescue plan of systemic corticosteroids or other medications if needed for acute exacerbations at any step.
- Check patient's inhaler, spacer/holding chamber, and peak flow technique.
- Review symptom/peak flow monitoring.
- Provide education, emphasizing medication adherence and medication administration technique.
- Review methods of reducing exposure to relevant allergens and irritants.
- Update and review written Asthma Action Plan.
- Monitor closely until control is achieved.

Referrals

Asthma Specialist

Consider referral to asthma specialist such as an allergist or pulmonologist when:

- Patient has had a life-threatening asthma exacerbation;
- Patient is not meeting the goals of asthma therapy after 3–6 months of treatment. An earlier referral or consultation is appropriate if the physician concludes that the patient is unresponsive to therapy;
- Signs and symptoms are atypical, or there are problems in differential diagnosis;
- Other conditions complicate asthma or its diagnosis, e.g., sinusitis, nasal polyps, ABPA, severe rhinitis, vocal cord dysfunction (VCD), GERD, chronic obstructive pulmonary disease (COPD);
- Additional diagnostic testing is indicated (e.g., allergy skin testing, rhinoscopy, complete pulmonary function studies, provocative challenge, bronchoscopy);
- Patient requires additional education and guidance on complications of therapy, problems with adherence, or allergen avoidance;
- Patient is being considered for immunotherapy;
- Patient requires step 4 care or higher (step 3 for children 0–4 years of age). Consider referral if patient requires step 3 care (step 2 for children 0–4 years of age) *(See age specific stepwise charts)*;
- Patient has required more than two bursts of oral corticosteroids in 1 year or has an exacerbation requiring hospitalization;
- Patient requires confirmation of a history that suggests that an occupational or environmental inhalant or ingested substance is provoking or contributing to asthma. Depending on the complexities of diagnosis, treatment, or the intervention required in the work environment, it may be appropriate in some cases for the specialist to manage the patient over a period of time or to co-manage with the primary care provider (PCP).

Behavioral Specialist

- Refer patients with significant psychiatric, psychosocial, or family stressors, which adversely affect their asthma control, to a behavioral health professional for treatment.

Health Plan and Community Agencies

- Contact individual health plan, local health department, or community agency for availability of:
  - Individualized case management;
  - Individualized asthma education;
  - Asthma classes/support groups;
  - Smoking cessation classes;
  - Assistance with durable medical equipment and medical supplies such as peak flow meters, spacers/holding chambers, nebulizers and compressors;
  - Home or school environmental assessment and remediation when possible.

Occupational Lung Disease

- Notify the New York State Department of Health Occupational Lung Disease registry at 1-866-807-2130 for patients suspected of having occupational asthma/lung disease. Services may include education and workplace evaluation.

Managing Special Situations

Patients who have asthma may encounter situations that will require adjustments to their asthma management to keep their asthma under control, such as EIB, pregnancy, and surgery.

Four Components of Asthma Care (Continued)

Heightened awareness of disparities and cultural barriers, improving access to quality care, and improving communication strategies between clinicians and ethnic or racial minority patients regarding use of asthma medications may improve asthma outcomes. *See Expert Panel Report 3 (EPR-3)*: Guidelines for the Diagnosis and Management of Asthma – Summary Report 2007. NIH Publication No 08-5846, October 2007, page 38-39 (**www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf**).

- **Exercise-Induced Bronchospasm (EIB):**
  EIB should be anticipated in all asthma patients. A history of cough, shortness of breath, chest pain or tightness, wheezing, or endurance problems during exercise suggests EIB.
- **Pregnancy:**
  Maintaining adequate control of asthma during pregnancy is important for the health of the mother and her baby.
  - Monitor asthma status during prenatal visits.
  - Albuterol is the preferred short-acting beta$_2$-agonist (SABA).
  - Inhaled corticosteroids (ICS), particularly budesonide, are the preferred long-term control medication because of documented safety and efficacy.
- **Surgery:**
  Patients who have asthma are at risk for specific complications during and after surgery.

2. Education for a Partnership in Care

- A partnership between the clinician and the person who has asthma (and the caregiver, for children) is required for effective asthma management.
- Asthma self-management education improves patient outcomes and can be cost effective.
- Asthma education and self management support should be tailored to the needs and literacy levels of the patient, and maintain sensitivity to cultural beliefs and ethnocultural practices.

Key Educational Messages: Teach and Reinforce at Every Opportunity

Basic Facts About Asthma

- The contrast between airways of a person who has and a person who does not have asthma; the role of the inflammation.
- What happens to the airways during an asthma attack.
- Role of Medications
  Understanding the difference between:
  - **Long-Term Control Medications:** Prevents symptoms, often by reducing inflammation. Must be taken daily. Do not expect long-term control medications to give quick relief.
  - **Quick-Relief Medications:** SABAs relax airway muscles to provide prompt relief of symptoms. Do not expect long-term asthma control. Using SABA >2 days a week indicates the need for starting or increasing long-term control medications.

Patient Skills

- Taking medications correctly:
  - Inhaler technique (demonstrate to the patient and have the patient return the demonstration);
  - Use of devices, as prescribed (e.g., valved holding chamber (VHC) or spacer, nebulizer).
- Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke.
- Self-monitoring:
  - Assess level of asthma control;
  - Monitor symptoms and, if prescribed, PEF measures;
  - Recognize early signs and symptoms of worsening asthma.
- Using a written Asthma Action Plan to know when and how to:
  - Take daily actions to control asthma;
  - Adjust medication in response to signs of worsening asthma;
  - Seeking medical care as appropriate.

Asthma Action Plan

- A written Asthma Action Plan based on peak flow and/or symptom monitoring, developed jointly with the patient, assists in managing asthma exacerbations. Update the Asthma Action Plan at every visit (at least every six months).
- **A written Asthma Action Plan should include:**
  - Recommended doses and frequencies of daily controller medications and quick-relief medications;
  - Information on what to do in case of an exacerbation (worsening symptoms and/or nocturnal awakenings);
  - Recommendations on avoidance of known allergens/irritants;
  - How to adjust medicines at home in response to particular signs, symptoms, and/or peak flow measurements;
  - A list of Peak Expiratory Flow (PEF) levels and/or symptoms indicating the need for acute care;
  - When and how to activate the EMS (Emergency Medical System) including emergency telephone numbers for the physician, and rapid transportation.
- **A copy of a patient's written Asthma Action Plan should be:**
  - Carried with the patient;
  - In the patient's medical record;
  - Provided to the patient's family;
  - Provided to the patient's school/daycare;
  - Provided to other contacts of the patient as needed, including extended care and camp.
- **Free Asthma Action Plans:**
  - Free Asthma Action Plans: (English and Spanish) are available at: **www.health.state.ny.us/diseases/asthma/brochures.htm**

3. Control of Environmental Factors and Co-morbid Conditions that Affect Asthma

Environmental Control Measures

- If patients with asthma are exposed to irritants or inhalant allergens to which they are sensitive, their asthma symptoms may increase and precipitate an asthma exacerbation. Substantially reducing exposure to these factors may reduce inflammation, symptoms, and need for medication.

For the patient's environment the provider should:

- Assess patient's exposure to and clinical significance of: **irritants** (e.g. tobacco smoke, smoke from wood burning stoves and fireplaces, dust generated by vacuum cleaning, and substances with strong odors and sprays, including volatile organic compounds [VOCs], chemicals); **exercise or sports** and **allergens** (e.g. animal dander, dust mites, cockroaches, mold, pollen, chemicals) and consider allergen testing. *See Expert Panel Report 3 (EPR-3)*: Guidelines for the Diagnosis and Management of Asthma – Summary Report 2007. NIH Publication No 08-5846, October 2007, pages 26-27 (**www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf**).
- Counsel, provide information and refer patients to appropriate services to reduce exposure to relevant allergens and irritants and prevent infections where possible.
  For Example: **Tobacco Smoke Exposure**
  - Assess for smoking and exposure to second-hand smoke;
  - Routinely advise and encourage patients and families to quit smoking;
  - Strongly advise against smoking indoors or in automobiles;
  - Initiate and/or refer to smoking cessation interventions and counseling and consider pharmacotherapy for patients and household members;
  - Inform patients that smoking cessation information and FREE Stop Smoking Kits are available through the New York State Smoker's Quitline. The toll-free number is 1-866-697-8487, or visit the website at www.nysmokefree.com.
- Effective allergen avoidance requires a comprehensive approach (such as a multifaceted allergen-control education program provided in the home setting); single steps alone are generally ineffective.
- Consider subcutaneous immunotherapy for patients who have allergies at steps 2-4 of care (mild or moderate persistent asthma) when there is a clear relationship between symptoms and exposure to an allergen to which the patient is sensitive.

Co-morbidity Management

- Manage, if present, allergic bronchopulmonary aspergillosis (ABPA), gastroesophageal reflux disease (GERD), obesity or overweight patients, obstructive sleep apnea (OSA), rhinitis/sinusitis, chronic stress/depression.

Four Components of Asthma Care (Continued)

4. Medications

Stepwise Approach to Asthma Management

(See Stepwise Approach for Managing Asthma in age-specific charts)

- The stepwise approach incorporates all four components of care: (1) assessment of severity to initiate therapy or assessment of control to monitor and adjust therapy; (2) patient education; (3) environmental control measures, and management of co-morbid conditions at every step; and (4) selection of medication.
- The type, amount, and scheduling of medication is determined by the level of asthma severity or asthma control.
  - Therapy is increased (stepped up) as necessary and decreased (stepped down) when possible. Gain control as quickly as possible, then decrease treatment to the least medication necessary to maintain control. The preferred approach is to start with more intensive therapy in order to more rapidly suppress airway inflammation and thus gain prompt control.
  - ICSs are the most consistently effective anti-inflammatory therapy for all age groups, at all steps of care for persistent asthma and the preferred first line treatment that results in improved asthma control.
- Provide a rescue plan of systemic corticosteroids or other medications if needed for acute exacerbations at any step.
- Spacers/holding chambers should be used with metered dose inhalers (MDIs).

See Long-Term Control and Quick-Relief charts for medications and usual dosages.

Check for availability and the health plan/insurance formulary when applicable.

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Classifying Asthma Severity & Initiating Treatment in Children 0–4 Years of Age

Assessing severity and initiating therapy in children who are not currently taking long-term control medication

Components of Severity		Classification of Asthma Severity: Children 0–4 Years of Age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	0	1–2x/month	3–4x/month	>1x/week
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
Risk	Exacerbations requiring oral systemic corticosteroids	0-1/year *(see note)*	≥2 exacerbations in 6 months requiring oral systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma		
		Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time.			
		Exacerbations of any severity may occur in patients in any severity category.			
Recommended Step for Initiating Therapy *(See Stepwise Charts for Treatment Steps.)*		Step 1	Step 2	Step 3 and consider short course of oral systemic corticosteroids	
		In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.			

Notes:
- Level of severity is determined by both impairment and risk. Assess impairment domain by caregiver's recall of previous 2–4 weeks. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past 6 months, or ≥4 wheezing episodes in the past year, and who have risk factors for persistent asthma may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control*

Lowest level of treatment required to maintain control *(See Stepwise Charts for Treatment Steps.)*	Classification of Asthma Severity			
	Intermittent	Persistent		
		Mild	Moderate	Severe
	Step 1	Step 2	Step 3 or 4	Step 5 or 6

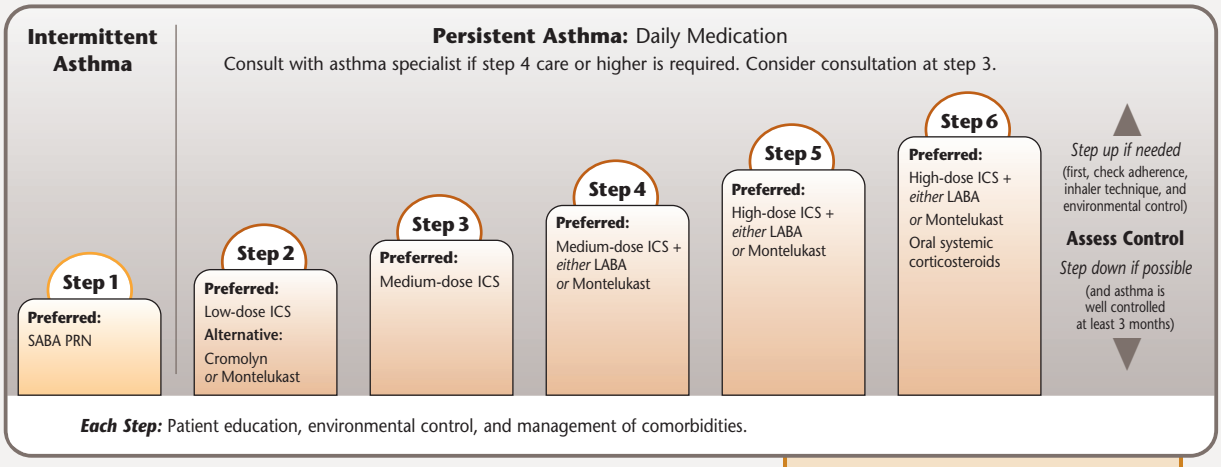
***Notes:**
- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

Assessing Asthma Control & Adjusting Therapy in Children 0–4 Years of Age

Components of Control		Classification of Asthma Control: Children 0–4 Years of Age		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤1x/month	>1x/month	>1x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	2–3/year	>3/year
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment *(See "Stepwise Approach for Managing Asthma" for treatment steps.)* The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.		• Maintain current treatment. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.	• Step up 1 step, and • Reevaluate in 2–6 weeks. • If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up 1–2 steps, and • Reevaluate in 2 weeks. • If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy. • For side effects, consider alternative treatment options.
		Before step up in therapy: • Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue it and use preferred treatment for that step.		

Notes:
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by caregiver's recall of previous 2–4 weeks. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

Stepwise Approach for Managing Asthma in Children 0–4 Years of Age



Key: *Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.* ICS, inhaled corticosteroid; LABA, inhaled long-acting beta$_2$-agonist; SABA, inhaled short-acting beta$_2$-agonist.

Notes:

- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- If clear benefit is not observed within 4–6 weeks and patient/family medication technique and adherence are satisfactory, consider adjusting therapy or alternative diagnosis.

Quick-Relief Medication for All Patients

- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms.
- With viral respiratory infection: SABA q 4–6 hours up to 24 hours (longer with physician consult). Consider short course of oral systemic corticosteroids if exacerbation is severe or patient has history of previous severe exacerbations.
- CAUTION: Frequent use of SABA may indicate the need to step up treatment.

Classifying Asthma Severity & Initiating Treatment in Children 5–11 Years of Age

Assessing severity and initiating therapy in children who are not currently taking long-term control medication

Components of Severity		Classification of Asthma Severity: Children 5–11 Years of Age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	• Normal FEV_1 between exacerbations • FEV_1 >80% predicted • FEV_1/FVC >85%	• FEV_1 = >80% predicted • FEV_1/FVC >80%	• FEV_1 >60–80% predicted • FEV_1/FVC = 75–80%	• FEV_1 <60% predicted • FEV_1/FVC <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year *(see note)*	≥2 in 1 year *(see note)*		
		Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category.			
		Relative annual risk of exacerbations may be related to FEV_1.			
Recommended Step for Initiating Therapy *(See Stepwise Charts for Treatment Steps.)*		Step 1	Step 2	Step 3, medium-dose ICS option and consider short course of oral systemic corticosteroids	Step 3, medium-dose ICS option, or step 4 and consider short course of oral systemic corticosteroids
		In 2–6 weeks, evaluate level of asthma control that is achieved, and adjust therapy accordingly.			

Notes:
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g. requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had 2 exacerbations requiring oral corticosteroids in the past 6 months, or 4 wheezing episodes in the past year, and who have risk factors for persistent asthma may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control*

Lowest level of treatment required to maintain control *(See Stepwise Charts for Treatment Steps.)*	Classification of Asthma Severity			
	Intermittent	Persistent		
		Mild	Moderate	Severe
	Step 1	Step 2	Step 3 or 4	Step 5 or 6

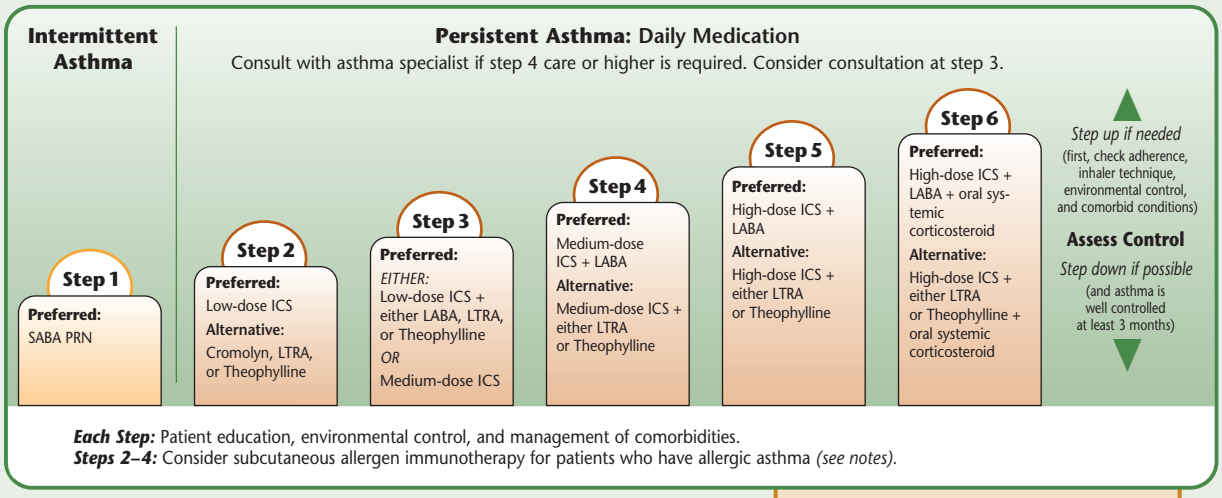
***Notes:**
- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

Assessing Asthma Control & Adjusting Therapy in Children 5–11 Years of Age

Components of Control		Classification of Asthma Control: Children 5–11 Years of Age		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week but not more than once on each day	>2 days/week or multiple times on ≤2 days/week	Throughout the day
	Nighttime awakenings	≤1x/month	≥2x/month	≥2x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta$_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	Lung Function: • FEV_1 or peak flow	>80% predicted/personal best	60–80% predicted/personal best	60% predicted/personal best
	Lung Function: • FEV_1/FVC	>80%	75–80%	<75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	>2/year *(see note)*	
	Reduction in lung growth	Evaluation requires long-term follow-up.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment *(See "Stepwise Approach for Managing Asthma" for treatment steps.)* The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.		• Maintain current step. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.	• Step up at least 1 step, and • Reevaluate in 2–6 weeks. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up 1–2 steps, and • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.
		Before step up in therapy: • Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue it and use preferred treatment for that step.		

Notes:
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had 2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with persistent asthma.

Stepwise Approach for Managing Asthma in Children 5–11 Years of Age



Each Step: Patient education, environmental control, and management of comorbidities.
Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma *(see notes).*

Key: *Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.* ICS, inhaled corticosteroid; LABA, inhaled long-acting beta$_2$-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta$_2$-agonist.

Notes:

- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.

Quick-Relief Medication for All Patients

- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- CAUTION: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.

Classifying Asthma Severity & Initiating Treatment in Youths ≥12 Years of Age & Adults

Assessing severity and initiating treatment for patients who are not currently taking long-term control medications

Components of Severity		Classification of Asthma Severity: Youths ≥12 Years of Age & Adults			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment Normal FEV_1/FVC: 8-19 yr 85%; 20-39 yr 80%; 40-59 yr 75%; 60-80 yr 70%	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	• Norm. FEV_1 between exacerbations • FEV_1 >80% predicted • FEV_1/FVC normal	• FEV_1 ≥80% predicted • FEV_1/FVC normal	• FEV_1 >60% but <80% predicted • FEV_1/FVC reduced 5%	• FEV_1 <60% predicted • FEV_1/FVC reduced 5%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year *(see note)*	≥2 in 1 year *(see note)*		
		Consider severity & interval since last exacerbation. Frequency & severity may fluctuate over time for patients in any severity category.			
		Relative annual risk of exacerbations may be related to FEV_1.			
Recommended Step for Initiating Therapy *(See Stepwise Charts for Treatment Steps.)*		Step 1	Step 2	Step 3 and consider short course of oral systemic corticosteroids	Step 4 or Step 5
		In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.			

Notes:
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had >2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control*

Lowest level of treatment required to maintain control *(See Stepwise Charts for Treatment Steps.)*	Classification of Asthma Severity			
	Intermittent	Persistent		
		Mild	Moderate	Severe
	Step 1	Step 2	Step 3 or 4	Step 5 or 6

Key: FEV_1, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit.

***Notes:**
- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

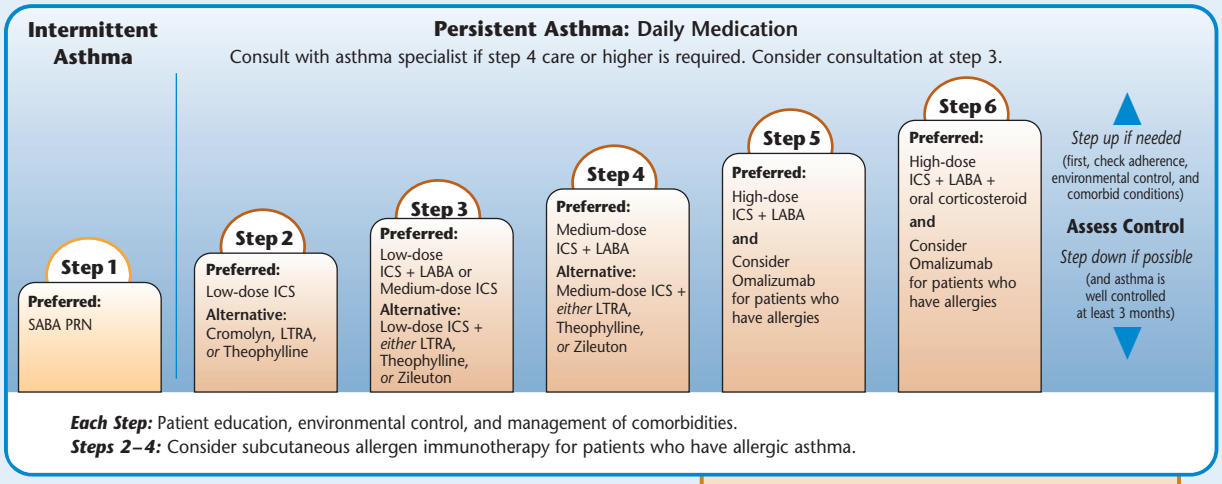
Assessing Asthma Control & Adjusting Therapy in Youths ≥12 Years of Age & Adults

Components of Control		Classification of Asthma Control: Youths ≥12 Years of Age & Adults		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	Lung Function: FEV_1 or peak flow	>80% predicted/personal best	60-80% predicted/personal best	<60% predicted/personal best
	Validated Questionnaires ATAQ ACQ ACT	 0 ≤0.75* ≥20	 1-2 ≥1.5 16–19	 3–4 N/A ≤15
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year *(see note)*	
		Consider severity and interval since last exacerbation.		
	Progressive loss of lung function	Evaluation requires long-term follow-up care.		
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		
Recommended Action for Treatment *(See "Stepwise Approach for Managing Asthma" for treatment steps.)* The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.		• Maintain current step. • Regular follow-ups every 1-6 months to maintain control. • Consider step down if well controlled for at least 3 months.	• Step up 1 step, and • Reevaluate in 2–6 weeks. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up 1–2 steps, and • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.
		Before step up in therapy: • Review adherence to medication, inhaler technique, environmental control, and comorbid conditions. • If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.		

*ACQ values of .76–1.4 are indeterminate regarding well-controlled asthma.

Notes:
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient's recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.
- ATAQ = Asthma Therapy Assessment Questionnaire©, ACQ = Asthma Control Questionnaire©, ACT = Asthma Control Test™ , Minimal Important Difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.

Stepwise Approach for Managing Asthma in Youths ≥12 Years of Age & Adults



Each Step: Patient education, environmental control, and management of comorbidities.
Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma.

Key: *Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.* ICS, inhaled corticosteroid; LABA, inhaled long-acting beta$_2$-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta$_2$-agonist.

Notes:
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.

Quick-Relief Medication for All Patients

- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- CAUTION: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.

Long-Term Control Medications

Estimated Comparative Daily Doses for Inhaled Corticosteroids

	Low Daily Dose			Medium Daily Dose			High Daily Dose		
Medication	Child 0–4 Years of Age	Child 5–11 Years of Age	≥12 Years of Age & Adults	Child 0–4 Years of Age	Child 5–11 Years of Age	≥12 Years of Age & Adults	Child 0–4 Years of Age	Child 5–11 Years of Age	≥12 Years of Age & Adults
Beclomethasone HFA 40 or 80 mcg/puff	NA	80–160 mcg	80–240 mcg	NA	>160–320 mcg	>240–480 mcg	NA	>320 mcg	>480 mcg
Budesonide DPI 90, 180, or 200 mcg/inhalation	NA	180–400 mcg	180–600 mcg	NA	>400–800 mcg	>600–1,200 mcg	NA	>800 mcg	1,200 mcg
Budesonide Inhaled Inhalation suspension for nebulization	0.25-0.5 mg	0.5 mg	NA	>0.5–1.0 mg	1.0 mg	NA	>1.0 mg	2.0 mg	NA
Ciclesonide MDI 80 or 160 mcg/puff	NA	80–160 mcg	160–320 mcg	NA	>160–320 mcg	>320–640 mcg	NA	>320 mcg	>640 mcg
Flunisolide MDI 80 mcg/puff	NA	160 mcg	320 mcg	NA	320–480 mcg	>320–640 mcg	NA	>480 mcg	>640 mcg
Fluticasone Furoate 100 or 200 mcg/actuation	NA	NA	100 mcg	NA	NA	200 mcg	NA	NA	>200 mcg
Fluticasone Propionate HFA/MDI 44, 110, or 220 mcg/puff	176 mcg	88–176 mcg	88–264 mcg	>176–352 mcg	>176–352 mcg	>264–440 mcg	>352 mcg	>352 mcg	>440 mcg
Fluticasone Propionate DPI 50, 100, or 250 mcg/inhalation	NA	100–200 mcg	100–300 mcg	NA	>200–400 mcg	>300–500 mcg	NA	>400 mcg	>500 mcg
Mometasone DPI# 110 or 220 mcg/inhalation	NA	110 mcg#	220 mcg	NA	110 mcg#	440 mcg	NA	110 mcg#	880 mcg

Key: DPI, dry powder inhaler; HFA, hydrofluoroalkane; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group).

For children 4 to 11 years of age: Mometasone starting dose and maximum dose are the same, 110 mcg/day. See: www.asmanex.com.

Therapeutic Issues:

- The most important determinant of appropriate dosing is the clinician's judgment of the patient's response to therapy. The clinician must monitor the patient's response on several clinical parameters and adjust the dose accordingly. Once control of asthma is achieved, the dose should be carefully titrated to the minimum dose required to maintain control.
- Preparations are not interchangeable on a mcg or per puff basis. This figure presents estimated comparable daily doses. *See EPR-3 Full Report 2007 for full discussion.*
- Some doses may be outside package labeling, especially in the high-dose range. Budesonide nebulizer suspension is the only inhaled corticosteroid (ICS) with FDA-approved labeling for children <4 years of age.
- For children <4 years of age: The safety and efficacy of ICSs in children <1 year has not been established. Children <4 years of age generally require delivery of ICS (budesonide and fluticasone HFA) through a face mask that should fit snugly over nose and mouth and avoid nebulizing in the eyes. Wash face after each treatment to prevent local corticosteroid side effects. For budesonide, the dose may be administered 1–3 times daily. Budesonide suspension is compatible with albuterol, ipratropium, and levalbuterol nebulizer solutions in the same nebulizer. Use only jet nebulizers, as ultrasonic nebulizers are ineffective for suspensions. For fluticasone HFA, the dose should be divided 2 times daily; the low dose for children <4 years of age is higher than for children 5–11 years of age due to lower dose delivered with face mask and data on efficacy in young children.
- Children ≤12 years of age (please refer to package insert for age appropriateness, drug interactions and potential adverse effects).

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

Long-Term Control Medications

Usual Doses for Long-Term Control Medications*

Medication		Dosage		
		0–4 Years of Age	5–11 Years of Age	≥12 Years of Age & Adults
Inhaled Corticosteroids	*See the above chart titled "Estimated Comparative Daily Dosages for Inhaled Corticosteroids."*			
Oral Systemic Corticosteroids	**Methylprednisolone** 2, 4, 8, 16, 32 mg tablets **Prednisolone** 5 mg tablets; 5 mg/5 cc; 15 mg/5 cc **Prednisone** 1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc; 5 mg/5 cc	0.25–2 mg/kg daily in single dose in a.m. or qod as needed for control Short-course "burst": 1–2 mg/kg/day, maximum 60 mg/day for 3–10 days	0.25–2 mg/kg daily in single dose in a.m. or qod as needed for control Short-course "burst": 1–2 mg/kg/day, maximum 60 mg/day for 3–10 days	7.5–60 mg daily in a single dose in a.m. or qod as needed for control Short-course "burst": to achieve control, 40–60 mg/day as single or two divided doses for 3–10 days
Inhaled Long-Acting Beta$_2$-Agonists (LABAs)	**Salmeterol** DPI: 50 mcg/ blister	NA	1 blister, q 12 hours Dose may be used for 4 years of age and older.	1 blister, q 12 hours
	Formoterol DPI: 12 mcg/single-use capsule	NA	1 capsule, q 12 hours	1 capsule, q 12 hours
Combined Medication	**Fluticasone/Salmeterol**** DPI: 100 mcg/50 mcg, 250 mcg/50 mcg, or 500 mcg/50 mcg; HFA: 45 mcg/21 mcg, 115 mcg/21 mcg, 230 mcg/21 mcg	DPI Diskus for ≥ 4 years of age	DPI only 1 inhalation bid, dose depends on level of severity or control	DPI or HFA 1 inhalation bid, dose depends on level of severity or control
	Fluticasone/Vilanterol DPI 100–25 mcg/inhalation or 200–25 mcg/inhalation	NA	NA	1 inhalation daily **This is indicated only for those 18 years of age and older.**
	Budesonide/Formoterol HFA MDI: 80 mcg/4.5 mcg, 160 mcg/4.5 mcg	NA	2 puffs bid, dose depends on level of severity or control	2 puffs bid, dose depends on level of severity or control
	Mometasone/Formoterol*** MDI: 100 mcg/5 mcg, 200 mcg/5 mcg	NA	NA	2 inhalations bid, dose depends on prior asthma therapy and asthma control
Cromolyn	**Nebulizer** 20 mg/ampule	1 ampule qid (NA <2 years of age)	1 ampule qid	1 ampule qid
Immunomodulators	**Mepolizumab** Subcutaneous injection, 100 mg/vial following reconstitution with 1.2 ml sterile water for injection	NA	NA	100 mg/1 ml SC q 4 weeks, for 12 years of age and older with eosinophilic phenotype
	Omalizumab (Anti IgE) Subcutaneous injection, 150 mg/1.2 ml following reconstitution with 1.4 ml sterile water for injection	NA	75 to 375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level **This is indicated for children 6 years of age and older.**	150–375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level
	Reslizumab 100 mg/10 ml solution for intravenous infusion	NA	NA	3 mg/kg once every 4 weeks by intravenous infusion over 20-50 minutes **This is indicated only for those 18 years of age and older.**
Leukotriene Modifiers Leukotriene Receptor Antagonists (LTRAs)	**Montelukast** 4 mg or 5 mg chewable tablet 4 mg granule packets 10 mg tablet	4 mg qhs (1–5 years of age)	5 mg qhs (6–14 years of age)	10 mg qhs
	Zafirlukast 10 mg tablet, 20 mg tablet	NA	10 mg bid (7–11 years of age)	40 mg daily (20 mg tablet bid)
5-Lipoxygenase Inhibitor	**Zileuton** 600 mg tablet	NA	NA	2,400 mg daily (give tablets qid)
	Zileuton CR 600 mg extended-release tablet	NA	NA	2,400 mg daily (give two 600 mg extended-release tablets bid)
Methylxanthines	**Theophylline** Liquids, sustained-release tablets, and capsules Monitor serum concentration levels	Starting dose 10 mg/kg/day; usual maximum: • <1 year of age: 0.2 (age in weeks) +5 = mg/kg/day • >1 year of age: 16 mg/kg/day	Starting dose 10 mg/kg/day; usual maximum: 16 mg/kg/day	Starting dose 10 mg/kg/day up to 300 mg maximum; usual maximum 800 mg/day
Long-Acting Muscarinic Antagonists	**Tiotropium Bromide** 1.25 mcg per actuation	NA	2 inhalations qd **This is indicated for children 6 years of age and older.**	2 inhalations qd

Key: DPI, dry powder inhaler; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; ICS, inhaled corticosteroids; IgE, immunoglobulin E; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); SABA, short-acting beta$_2$-agonist.

** See **www.advair.com**

*** See **www.dulera.com**

***NOTE:** Dosages are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use. For advisories and other relevant information see **www.fda.gov/medwatch**.

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

Quick-Relief Medications

Usual Doses for Quick-Relief Medications*

For quick-relief medications for asthma exacerbations, other than Albuterol, see NAEPP EPR-3 Summary Report 2007, NIH Publication number 08-5846, pages 53-60. (**www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf**, page 53)

	Dosage		
Medication	**<5 Years of Age**	**5–11 Years of Age**	**≥12 Years of Age & Adults**
Inhaled Short-Acting Beta$_2$-Agonists			
Albuterol HFA MDI 90 mcg/puff; 60 puffs/canister or 200 puffs/canister	2 puffs every 4–6 hours, as needed for symptoms; 1–2 puffs 5 minutes before exercise	2 puffs every 4–6 hours, as needed for symptoms; 2 puffs 5 minutes before exercise	2 puffs every 4–6 hours, as needed for symptoms; 2 puffs 5 minutes before exercise
Albuterol Nebulizer Solution 0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)	0.63–2.5 mg in 3 cc of saline q 4–6 hours, as needed	1.25–5 mg in 3 cc of saline q 4–8 hours, as needed	1.25–5 mg in 3 cc of saline q 4–8 hours, as needed
Albuterol Sulfate Inhalation Powder 108 mcg/actuation; 200 actuations/canister	NA	NA	2 inhalations q 4–6 hours, as needed for symptoms; 2 inhalations 15–30 minutes before exercise
Levalbuterol HFA 45 mcg/puff; 200 puffs/canister	NA <4 years of age	2 puffs every 4–6 hours, as needed for symptoms; 2 puffs 5 minutes before exercise	2 puffs every 4–6 hours, as needed for symptoms; 2 puffs 5 minutes before exercise
Levalbuterol (R-albuterol) Nebulizer Solution 0.31 mg/3 mL, 0.63 mg/3 mL, 1.25 mg/0.5 mL, 1.25 mg/3 mL	0.31–1.25 mg in 3 cc, q 4–6 hours, as needed for symptoms	0.31–0.63 mg, q 8 hours, as needed for symptoms	0.63–1.25 mg, q 8 hours, as needed for symptoms
For Asthma Exacerbations	**Children ≤12 years of age**		**>12 Years of Age & Adults**
Albuterol MDI 90 mcg/puff	4–8 puffs every 20 minutes for 3 doses, then every 1–4 hours inhalation maneuver as needed. Use VHC; add mask in children <4 years.		4–8 puffs every 20 minutes up to 4 hours, then every 1–4 hours as needed.
Albuterol Nebulizer solution 0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)	0.15 mg/kg (minimum dose 2.5 mg) every 20 minutes for 3 doses then 0.15–0.3 mg/kg up to 10 mg every 1–4 hours as needed, or 0.5 mg/kg/hour by continuous nebulization.		2.5–5 mg every 20 minutes for 3 doses, then 2.5–10 mg every 1–4 hours as needed, or 10–15 mg/hour continuously.
Medication *(continued)*	**<5 Years of Age**	**5–11 Years of Age**	**≥12 Years of Age & Adults**
Anticholinergics			
Ipratropium HFA MDI 17 mcg/puffs, 200 puffs/canister	NA	NA	2–3 puffs q 6 hours
Ipratropium HFA Nebulizer solution 0.25 mg/mL (0.025%)	NA	NA	0.25 mg q 6 hours
Ipratropium with Albuterol 20 mcg ipratropium bromide/100 mcg albuterol per actuation	NA	NA	1 inhalation 4 times a day
Ipratropium with Albuterol Nebulizer solution 0.5 mg/3 mL ipratropium bromide and 2.5 mg/3 mL albuterol	NA	NA	3 mL q 4–6 hours
Systemic Corticosteroids			
Methylprednisolone 2, 4, 6, 8, 16, 32 mg tablets **Prednisolone** 5 mg tablets, 5 mg/5 cc, 15 mg/5 cc **Prednisone** 1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc, 5 mg/5 cc	Short course "burst": 1–2 mg/kg/day, maximum 60 mg/day, for 3–10 days	Short course "burst": 1-2 mg/kg/day, maximum 60 mg/day for 3-10 days	Short course "burst": 40–60 mg/day as single or 2 divided doses for 3–10 days
Repository injection (Methylprednisolone acetate) 40, 80 mg/mL	7.5 mg/kg IM once	240 mg IM once	240 mg IM once

Key: CFC, chlorofluorocarbon; ED, emergency department; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; IM, intramuscular; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); PEF, peak expiratory flow; SABA, short-acting beta$_2$-agonist; VHC, valved holding chamber.

***NOTE:** Dosages are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use. For advisories and other relevant information see **www.fda.gov/medwatch**.

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

Developed by the New York State Consensus Asthma Guideline Expert Panel, and endorsed by the New York State Department of Health, New York City Department of Health and Mental Hygiene, New York Heath Plan Association, New York State Coalition of Prepaid Health Services Plans, Empire Blue Cross Blue Shield, Excellus, Medical Society of the State of New York, New York State Academy of Family Physicians, New York Chapter American College of Physicians, American Academy of Pediatrics, District II, New York State Thoracic Society, American Lung Association of New York, the New York State Society of Allergy, Asthma & Immunology, Inc., and Monroe County Medical Society.

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